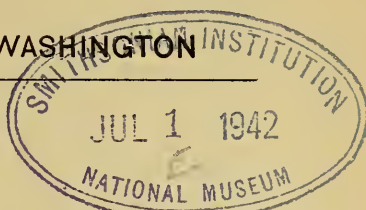


PROCEEDINGS  
OF THE  
BIOLOGICAL SOCIETY OF WASHINGTON



A NEW FROG FROM THE ANAMALLAI HILLS, WITH  
NOTES ON OTHER FROGS AND SOME SNAKES  
FROM SOUTH INDIA.

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Since the days of Jerdon and Beddome the Anamallai, Nilgiri and other hill regions of Southern India have produced a succession of strange batrachian and reptilian novelties that have made the Southern Indian Peninsula a herpetological promised land, comparable in its rich fauna to the Organ Mountains of Brazil, the eastern slopes of the Ecuadorian Andes, the mountains of New Guinea, Cameroon, the Shan Plateau and the interior of Madagascar. It was for this reason that I asked Dr. Albert W. Herre, when preparing for his recent Asiatic journey, to make an especial effort to obtain amphibians and reptiles during his stay in the Anamallais. Although the weather was most unfavorable, his time was short, and his principal efforts were ichthyological, the material he obtained bears witness to his ability as a collector and to the continued herpetological productiveness of the hills of South India. Not all of the Anamallai collection has yet been examined, but no purpose is served by withholding description of one strange new frog. I have also added records of some other frogs and of two Uropeltid snakes from South India.

*Nannobatrachus anamallaiensis*, new species.

*Diagnosis.*—A *Nannobatrachus* with a rounded or horizontally ovoid pupil; tympanum entirely concealed; tibiotarsal articulation not or barely reaching eye when leg is brought forward; vomerine teeth behind the choanae, in transverse or somewhat oblique patches, each with a single row of teeth; tongue without a button-like structure in front; and the upper surface of the femur and tibia with dark crossbars.

*Holotype*.—Stanford Amphibian Catalogue No. 7197; Puthutotam Estate, Valparai P. O., Anamallai Hills, Southern India; January 9, 1941; Dr. A. W. Herre, collector.

*Paratypes*.—Seven specimens; Cat. No. 7198–7204; taken at same place and on same date as holotype; one specimen in Field Museum.

*Description*.—Pupil rounded or horizontally ovate in all specimens; on one side of two of the specimens there is a trace of a point at the lower median border of the pupil, but in none is there any definite trace of such a point above, or of the “erect” or “squarish” form of pupil ascribed to *N. beddomii*. Eyes bulging, directed outward, forward, and upward, the upper eyelid narrow, its width equal to slightly more than half that of the interorbital space. Vomerine teeth weak and inconspicuous, scarcely or not at all evident in specimens of 12.5 mm. In the larger specimens the vomerine tooth patches are transverse or slightly oblique, originating at the inner anterior corner of the eye sockets, far behind the choanae; the patches are short, each bearing a single row of four to six blunt teeth, and are separated by a space slightly less than the length of one series. The tooth row of each patch is strictly single and regular; in most of the specimens the rows are straight but in 7199 they are curved, the convexity directed posteriorly. Choanae separated by a distance equal to the interorbital width. Tongue oval or elongate-oval, without a papilla or a button-like structure in front and with a shallow but distinct nick behind. Lower jaw with the usual central and two flanking projections, but the lateral ones are not produced into odontoids. Eustachian tubes conspicuous.

Body moderately stout, somewhat elongate, rather similar to a small *Dendrobates* in form, the legs moderately short and massive. Head short and as broad as body but not greatly flattened, the profile rather sharp and similar in general appearance to that of *Nyctibatrachus major*. Head length from basis cranii to snout tip slightly less than its greatest width. Snout short, decurved, rounded in front, slightly projecting beyond the mouth, its oblique length from either eye to the middle of the tip greater than the interorbital width or the eye. No canthus rostralis, the extremely short loreal region very oblique, forming (in cross-section of the head) no area really distinct in its configuration from the even convex curve of the top of the head. The nostril is considerably nearer to the eye than to the middle of the tip of the snout. Distance between the nostrils equal to interorbital width. Tympanum entirely obscured by the rough integument of this area. An extremely poorly defined post-tympanal fold. The line of the upper lip curves slightly upward near the end of the mouth, producing a faintly “smiling” expression.

Fingers slender, free, first considerably shorter than second, which reaches the proximal end of the penultimate phalanx of the third. Fourth finger barely longer than second. Subarticular tubercles of fingers very weak except those at base of each finger. A flat but well developed, curved, inner palmar tubercle and a similar outer one. Palm otherwise smooth except for the interdigital grooves. Disks of fingers little developed, scarcely wider than penultimate phalanges of fingers, equal on all fingers,

each pad with a median longitudinal groove on the distal part of the dorsal surface. Arms relatively robust.

Toes slender, free or with the barest rudiment of a web, first reaching proximal articulation of penultimate phalanx of second, second not reaching same point on third, but third reaching same point on fourth. The fifth toe barely reaches the proximal articulation of the third from last segment of the fourth. Subarticular tubercles plain but not strongly projecting. Disks of same structure as those of fingers, but somewhat larger, that of first toe little developed. Outer metatarsals separated by a groove only. A very weakly developed but perfectly evident outer metatarsal fold running from base of first finger to distal end of tarsus. A small, oval inner metatarsal tubercle, connected by a strong dermal fold with a smaller tubercle (or flap) placed near the distal end of the tarsus in the middle of its postero-inferior surface.

Legs relatively stout and short, the heels meeting but not overlapping when femur and tibia are placed at right angles to body axis, the tibiotarsal articulation reaching to the tympanal area or rarely to the middle of the eye when leg is brought forward along body. Only in the two smallest paratypes does the tibiotarsal articulation fully reach the center of the eye. Thigh from groin to knee considerably longer than fourth toe. Breadth of tibial part of leg slightly less than three times in its length, which goes about twice in distance from nares to anus. Tarsus (without metatarsals) short, about twice interocular width.

Skin rather smooth on dorsum, but when slightly dried it appears strongly areolated; posterior part of back with scattered small warts. Along the sides the skin is rougher, sometimes with longitudinal chains of weak elongated warts. Upper eyelid weakly areolated, somewhat rougher posteriorly. Upper surfaces of thighs like dorsum, but the surface of the tibia bears several small rounded warts in some of the specimens. Tympanal and rictal area somewhat rougher than dorsum, with a remnant of a post-tympanal fold running down towards arm. Some of the examples have a few enlarged post-rictal warts. An enlarged white glandular wart (weak in some) just above insertion of arm. A strong glandular fold from lower posterior rim of eye downward and backward to the rictus. Under surfaces smooth.

General coloration brownish. The dorsum is lighter brown above a line on each side from eye to groin (in the position of the dorsolateral glandular fold of frogs possessing such a structure). Mesad of this the dorsum becomes gradually dark and bears irregular darker markings, thus giving the appearance in some examples of a light dorsolateral line down each side separating the dark middorsal area from the dark sides. A triangular area, its base between the eyes and its point near the snout tip, is also light. Legs light brown, with four or five dark crossbands which cross the femur, tibia, and tarso-metatarsus. Belly clear light yellowish, the gular region and under surfaces of the legs with a brown wash. One example (No. 7198) has the color pattern intensified by a peculiar lightening of all the lighter areas and a darkening of the dark ones. It is a pale yellowish, with a dark dorsolateral line down each side, the light dorsal area between

marked with irregular dark hieroglyphics and the sides still more heavily covered with these markings; the arms, fingers, legs, and toes are all pale, with brilliantly contrasted dark cross bands, even upon the toes. This example lacks the brownish wash on the throat.

Length of holotype, from snout tip to vent, 17 mm. Head, from snout tip to basis cranii, 6. Greatest width of head 6.7. Length femur from midline of body 7.7. Length tibia 7.2. Length free portion fifth toe 5.

The specimens range downward in size from that of the type to a length of 12.5 mm. Three of the paratypes (7198-7200) are as large as the type, and one (7204) was evidently originally a millimeter or more longer, but this example was received in a very badly damaged condition. The rest of the series is most beautifully preserved, having been killed, fixed and shipped in 3 or 4 per cent formalin; they are now in 65 per cent alcohol.

*Habitat*.—Dr. Herre tells me that he collected these frogs in and out of the water in a marshy pasture through which a small brook was running. They were taken with young *Rana verrucosa* and young *R. temporalis*. The elevation was 3,600 to 3,800 ft.

*Comparisons and discussion*.—Two species of the genus *Nannobatrachus* have been described. The genus was erected by Boulenger (1882, *Cat. Batr. Sal.*, p. 470) for a small species from Malabar, *N. beddomii*. The brief specific diagnosis contained an error in regard to the comparative dimensions of the upper eyelid and interorbital, which was corrected by Boulenger in 1883 (*Ann. Mag. Nat. Hist.*, ser. 5, vol. 12, p. 163, footnote). Little has subsequently been added to our knowledge of this tiny frog. The first item in Boulenger's generic description was "pupil erect" (*i. e.*, vertically elongated). However, Noble, who had probably examined Boulenger's types in the British Museum, diagnosed *Nannobatrachus* as "a small *Rana* having a squarish pupil" (1931, *Biol. Amph.*, p. 519). In 1937 (*Proc. Indian Acad. Sci.*, ser. B, vol. 6, no. 6, p. 401, pl. 24) Narayan Rao described *N. kempholeyensis* from the Kempholey Ghats, Mysore, as possessing a horizontally ovate pupil. The systematic value of a vertical versus a horizontal pupil has been pondered by many herpetologists. Rao has remarked that the condition of the pupil in life may bear little relation to that in preserved examples, but in batrachian classification the shape of the pupil has been used almost exclusively in work with preserved specimens, and I know of no instance in which preserved examples of a single species exhibit a variation from a vertically "erect" pupil to a horizontally elongate one. In view of Noble's correction of Boulenger's description of the pupil of *beddomii* it is evident that that species does not possess the extreme type of vertical pupil exhibited by *Nyctibatrachus*, and, taking into account *kempholeyensis* and *anamallaiensis* as well, *Nannobatrachus* can no longer be considered to be characterized by an "erect" pupil. It is interesting to note that my series of *anamallaiensis* and the specimens of *Nyctibatrachus major* recorded below were fixed and preserved in the same manner (by dropping them alive into 3 or 4 per cent formalin, in which they were shipped home), yet exhibit the greatest distinctiveness in form of pupil.

The form of the pupil in my series of *anamallaiensis* varies from almost

circular to a somewhat elongate oval, one or two frogs showing a very slight inferior median projection. The pupils are all small, and are plainly not greatly dilated, the frogs having been caught and preserved in the daytime, when the pupils are normally contracted into the characteristic shape. I therefore believe that the absence of any approach toward a squarish form indicates some specific difference between this species and *beddomii*. In *beddomii* the tibiotarsal articulation is said to reach or nearly reach the tip of the snout, and the vomerine tooth patches are described as oval, rather than linear. Except for these characters *anamallaiensis* agrees with the lamentably brief and incomplete diagnosis of *beddomii*, but the differences in leg length and vomerine teeth are considerable for such small and relatively characterless frogs, and direct comparison will probably bring to light still other differences.

Certainly *anamallaiensis* is much more closely related to *beddomii* than to *kempholeyensis*, which differs sharply from the two former in the presence of a button-like papilla on the tongue, in the much more anterior vomerine teeth (arising from the anterior borders of the choanae), in the more anterior nares, in the less oblique lores, and in the absence of distinct cross-bars on the legs.

With the removal of the "vertical pupil" from the diagnosis of *Nannobatrachus*, the question of the validity of the genus inevitably arises. Cope (1889, *Bull. U. S. Nat. Mus.*, no. 34, p. 391) and Roux (1905, *Zool. Anz.*, vol. 28, pp. 777-785) both separate *Nyctibatrachus* widely from *Nannobatrachus* and *Nannophrys* on the basis of the cartilaginous sternum of the two latter genera. This character is certainly of only minor value in evaluating Ranid phylogeny, and both Cope's and Roux's systems are now considered too artificial for use. Both include in the Ranidae genera now known to belong to widely different families. Nor does Deckert's recent review of Ranid classification (*Sitzb. Gesellsch. Naturforsch. Freunde*, 1939, pp. 127-184) help, since he has not considered these three genera.

*Nyctibatrachus* seems to have bony styles to both sternum and omosternum (Boulenger, 1882; Noble, 1931). Boulenger described the sternal styles of *Nannophrys* as like those of *Nannobatrachus*, but Noble gives a cartilaginous omosternum and bony sternum for *Nannophrys*. Of the three genera, *Nyctibatrachus* alone has separated outer metatarsals, but this genus agrees with *Nannobatrachus* and not with *Nannophrys* in the bifurcated terminal phalanges. *Nyctibatrachus* has webbed toes, the others free. Other species of *Nyctibatrachus* and *Nannobatrachus* described since 1882 tend to obliterate other differences that apparently held in the species Boulenger had at that time. For example, the eyes of his original two *Nyctibatrachus* were directed partly upward and they had covered tympana, while the two *Nannophrys* had lateral eyes and visible tympana, but these differences are now broken down (see Rao, 1937; and others). It is evident that some revision of the generic relationships is necessary, but enough characters are still available to allow us to recognize all three genera. Of course both *Nannophrys* and *Nannobatrachus* might both be referred to *Rana* (*sensu lato*) but to anyone who has seen these strange little frogs they are even more unlike *Rana* than *Staurois* (*sensu stricto*), *Nanorana* or *Altirana*.

*Nyctibatrachus major* Boulenger.

A fine example of 30 mm., a young of 21 mm., and a newly transformed specimen of 19 mm. still with the tadpole tail (Nos. 7254-7256), all collected near Valparai, on January 8-9, 1941. *Nyctibatrachus major* is hereby designated the type species of the genus *Nyctibatrachus* Boulenger 1882.

*Rana verrucosa* Günther.

Dr. Herre obtained a number of these exceedingly warty frogs near Valparai, on January 8 and 9, the smallest 13 and the largest example 61 mm. in length from snout tip to vent (Nos. 6660-6662, 7243-7249). The smallest shows no sign of the tadpole tail, but must be a young of the year. This frog evidently metamorphoses at a very small size. The tadpole has been described by Annandale.

In a recent paper on the pectoral osteology and classification of the Ranid frogs, Deckert (*Sitzb. Gesellsch. Naturforsch. Freunde*, Berlin, 1938, pp. 127-184, 49 figs.) has referred *Rana verrucosa*, together with *cyano-phlyctis*, *limnocharis*, *tigerina*, *occipitalis*, *cancrivora*, *galamensis*, *grayi*, *grunniens*, *brevipalmatus*, *kuhlii*, *microtympnum*, *doriae*, *microdisca*, *modesta*, *macrodon* and *corrugata*, to the resurrected genus *Dicroglossus* Günther 1860. Deckert defines this principally upon the *overlapping* fusion of the mesial ends of the coracoid bones with the median cartilage, a character ("Arzizonie" of Deckert) which he finds among other Ranidae only in *Arthroleptides*, *Scotobleps*, *Astylosternus* (including *Trichobatrachus*) and the *Pyxicephalus* group of *Rana*.<sup>1</sup> Other Ranids, it would appear, have the mesial ends of the coracoids meeting the median cartilage upon the same plane and not overlapping ("Laxizonie" of Deckert). While I am not at all sure that Deckert's rather drastic reclassification of the Ranids has done much to solve several vexing problems (*e. g.*, the true phylogenetic delimitation of *Hylarana* and *Staurois*), the character of the coracoid articulation would appear to be of considerable importance. Certainly most of the species Deckert places in *Dicroglossus* are closely related, this showing up not only in the hypertrophy of the odontoids of the mandible but also in such apparently trivial characters as the frequent appearance of a pair of elongate diverging folds or warts on the middle of the back (*macrodon*, *blythii*, *doriae*, *microdisca*, *leytensis*, *verrucosa*). The group is probably a truly phylogenetic one, but since in taxonomy phylogenetic arrangement is everything and the nomenclature relatively immaterial, it does not seem necessary to give *Dicroglossus* generic rank, at least until many species not seen by Deckert have been examined. Noble (*Biol. Amphib.*, 1931) likewise made out an excellent case for the generic recognition of *Hylarana*, even placing it in a subfamily different from that in which he placed *Rana* (a move which I think rather ill founded), but until a number of species not available to Noble have been examined, with care and a phylogenetic insight not always evident among some recent batra-

<sup>1</sup> See also Noble, 1926, *Amer. Mus. Novit.*, no. 230, p. 12, fig. 6. It would be interesting to determine whether the tadpoles of the "arzizon" *Ranas* differ as a group from those of other *Ranas*.

chologists who have worked upon the Indo-Malayan fauna, I prefer to continue to recognize *Hylarana* as a subgenus only, no matter how "natural" a group it may be. It should be remembered that a subgenus, no less than a genus, can and should express the known phylogenetic relationships.

*Rana beddomii* (Günther).

There are four examples of this forest frog from Puthototam Estate near Valparai, collected January 9, 1941 (Nos. 7257–7260).

*Rana temporalis* Günther.

This species was taken in some abundance near Valparai (Nos. 7250, 7233–7240). This species and the two preceding were reported from the same region by Roux in 1928 (*Rev. Suisse Zool.*, vol. 35, no. 21, pp. 459–461). All of the Valparai *temporalis* have the black tympanal band continued backward, the entire sides being dark.

*Siluboura nigra* Beddome.

One female (Stanford Rept. Cat. No. 9113) from the Kodai Kanal Hills (elevation 6,000 ft.) in the Palnis was obtained for Dr. Herre by Dr. C. P. Gnanamuthu. Ventrals 182 from chin, subcaudals 7. Under the International Rules of Zoological Nomenclature the original orthography of Gray's generic name must be retained, since there is no evidence that his spelling was a *lapsus calami* or a typographical error. Peters emended the name to *Silybura*, but this is contrary to the Rules.

*Platyplectrurus madurensis* Beddome.

A fine suite of eight specimens of this uncommon Uropeltid were also obtained for Dr. Herre in the Kodai Kanal Hills (6,000 ft.), Palnis, by Dr. Gnanamuthu. The catalogue numbers, sex, and ventral (from chin) and subcaudal counts are as follows: 9114, male, 169–14; 9115, male, 167–13; 9116, female, 178–11; 9117, male, 172–11; 9118, female, 171–10; 9119, female, 175–10; 9120, male, 165–13; 9121, female, 174–11.

